Development of novel organic ionic plastic crystals

Expectation for flexible, transparent and highly conductive solid electrolyte

We have developed a new attractive candidate for solid electrolyte, so called "organic ionic plastic crystals (OIPCs)", through our ionic liquids (ILs) study. One of the salts composed of much familiar cations and anions used for ILs preparation is solid even in 90 ºC, however, this solid salt possesses plastic crystal phase in a wide range of temperatures from -50 ºC to 90 ºC. The OIPC is totally transparent and is a flexible self-standing film. Surprisingly, the conductivity of the OIPC with slight addition of Li salt (5 mol%) is 10^{-3} S cm^{-1} even in a solid at 25 ºC.

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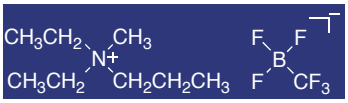

N_{1223} $[CF_3BF_3]$ m.p. 95 ℃ (ΔS_m = 7.4 J K^{-1} mol^{-1})

Photo image and chemical structure of developed organic ionic plastic crystal $N_{1223}[CF_3BF_3]$

Development of high-performance inorganic adsorbent for carbon dioxide

Efficient capture of carbon dioxide above atmospheric pressure

We have developed an efficient inorganic adsorbent for carbon dioxide. This adsorbent is porous material made of hydroxyl aluminum silicate. This material can be synthesized easily from cheap raw materials. As the material can be produced in a large scale, low cost production would be possible. The amount of adsorbed carbon dioxide on this material is more than 10 wt% when the pressure of carbon dioxide is raised from 100 kPa (atmospheric pressure) to 900 kPa. This value is about two times larger than the amount of carbon dioxide adsorbed on zeolite 13X, which is now used for a carbon dioxide capture system. If the pressure swing adsorption (PSA) system can be operated above atmospheric pressure by using this material, the PSA system can collect carbon dioxide with low cost compared with the present system.

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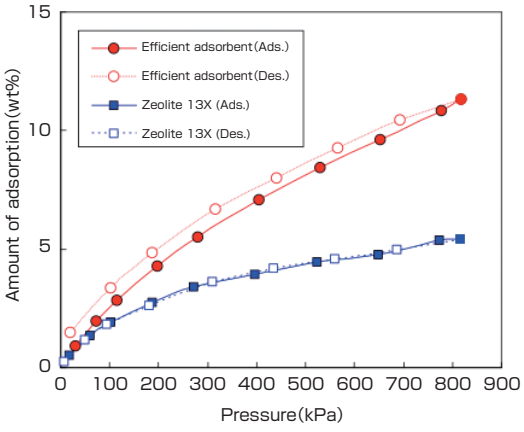

Carbon dioxide adsorption/desorption isotherm of the developed adsorbent and zeolite 13X (standard zero at atmospheric pressure)